2020 Peninsula Gateway Corridor Study

Draft Memorandum
Task 5 – Travel Forecasting

Prepared for:

City/County Association of Governments
Of San Mateo County

San Mateo County Transportation Authority

Santa Clara Valley Transportation Authority

Prepared by:

Kimley-Horn
and Associates, Inc.

December 22, 2006

This memorandum summarizes forecasts of traffic volumes and volume/capacity (v/c) ratios for the alternatives under study. It is part of *Task 5 – Travel Forecasting* of the 2020 Peninsula Gateway Corridor Study, which is being conducted by Kimley-Horn and Associates (KHA) for the City/County Association of Governments of San Mateo County (C/CAG), the San Mateo County Transportation Authority, and the Santa Clara Valley Transportation Authority. This memorandum effectively synthesizes a series of traffic forecasts, prepared by C/CAG through its Consultant, Hexagon Transportation Consultants, into simple graphics containing no-build and build peak period traffic volumes and volume-to-capacity ratios for year 2025. The intent is to provide enough data to help evaluate the relative differences between alternatives and not provide all the details of the travel model network that Caltrans, for example, would need to evaluate no-build and build conditions for specific improvements in a formal Project Study Report (PSR) or Project Report/ Environmental Document (PR/ED) process. For reference the Appendix discusses the travel model results in the context of validation of base year conditions and future year 2025 results.

The Technical Advisory Committee (TAC) is requested to review and provide feedback and comments on the information provided herein, especially the relative changes noted between no-build and build cases for each alternative, which will be shared with the Policy Advisory Committee. The results of this cycle of production and reviews will be used in *Task 6 -- Operational Analysis*, which will summarize these findings and other analytical results with respect to measures of effectiveness by alternative.

This memo has been updated to incorporate comments from Caltrans as well as issues discussed by TAC members at the last TAC meeting. The Caltrans evaluation also identified three items that will require additional modeling analysis:

- Increased traffic on Bayfront Expressway as a result of Alternative 1
- Origin and destination of express lane traffic
- Increased traffic on University Ave. as a result of Alternatives 6 and 7.

Year 2025 Forecasts

Year 2025 travel forecasts, in the form of peak period (AM 3 hour and PM 3 hour) traffic volumes and peak period (AM 3 hour and PM 3 hour) v/c ratios, were prepared by C/CAG for the following alternatives under study:

- 1 US 101 Auxiliary Lanes and Interchange Improvements
- 2A US 101 Elevated Express Lanes
- 3 Grade Separations on Bayfront Expressway
- 6 Willow Road *Elevated* Express Lanes
- 7 Willow Road *Depressed* Express Lanes
- 9 University Avenue Depressed Express Lanes.

The alternatives were described in previous technical memoranda.

Individual forecasts were prepared for each alternative with the exception of Alternatives 6 and 7, for which a single forecast was prepared given the layouts of the elevated and depressed elements are considered identical from a modeling perspective. The traffic forecasts are presented in the following figures.

Alternative 1: US 101 Auxiliary Lanes and Interchange Improvements:

1. Year 2025 AM Peak Period Traffic Volumes
2. Year 2025 PM Peak Period Traffic Volumes
3. Year 2025 AM Peak Period V/C Ratios
4. Year 2025 PM Peak Period V/C Ratios

Alternative 2A: US 101 Elevated Express Lanes

5. Year 2025 AM Peak Period Traffic Volumes
6. Year 2025 PM Peak Period Traffic Volumes
7. Year 2025 AM Peak Period V/C Ratios
8. Year 2025 PM Peak Period V/C Ratios

Alternative 3: Grade Separations on Bayfront Expressway

9. Year 2025 AM Peak Period Traffic Volumes
10. Year 2025 PM Peak Period Traffic Volumes
11. Year 2025 AM Peak Period V/C Ratios
12. Year 2025 PM Peak Period V/C Ratios

Alternative 6: Willow Road *Elevated* Express Lanes and
Alternative 7: Willow Road *Depressed* Express Lanes

13. Year 2025 AM Peak Period Traffic Volumes
14. Year 2025 PM Peak Period Traffic Volumes
15. Year 2025 AM Peak Period V/C Ratios
16. Year 2025 PM Peak Period V/C Ratios

Alternative 9: University Avenue Depressed Express Lanes

17. Year 2025 AM Peak Period Traffic Volumes
18. Year 2025 PM Peak Period Traffic Volumes
19. Year 2025 AM Peak Period V/C Ratios
20. Year 2025 PM Peak Period V/C Ratios.

Discussion

The following points highlight the forecasted volumes and volume/capacity ratio changes under each "Build" alternative relative to "No-Build" conditions.

- Alternative 1 would increase traffic volumes on US 101 where the auxiliary lanes are added and the net increase in capacity there would result in small reductions in v/c ratios. On balance, this indicates a net benefit.
- Alternative 2A would increase US 101 traffic demand by 8,000 to 9,000 peak period vehicles in each direction -- in the express lanes -- and draw additional traffic demand to

US 101. Like in the at-grade lanes, volumes would exceed capacity in the express lanes. Small changes in volumes and v/c ratios are shown for the at-grade lanes on US 101. The increase in throughput would be a benefit, but the v/c ratios indicate continued delay for all vehicles. There is evidence that the model diverted some traffic from cross streets to the express lanes, which is to be expected given the express lanes provide enhanced travel time through a long segment of US 101 (see University Avenue, Embarcadero Road, and Oregon Expressway).

- Alternative 3 would increase in peak period traffic on Bayfront Expressway east of University, on Willow Road during both peak periods, and on University Avenue in the a.m. peak period. The model also projected increases in peak period traffic on Clarke and Pulgas, which is evidence that additional capacity at the Bayfront Expressway intersections will draw traffic through residential streets as well as University Avenue. Corresponding changes in v/c ratios were noted.
- Alternatives 6/7 would result in a net increase in traffic on Willow Road due to the express lanes but decreases or small increases in at-grade. Corresponding improvements are shown in v/c ratios for the at-grade facility. The express lanes do generate strong peak direction demands that exceed capacity, which suggests that additional capacity should be considered in the peak direction. Also noted are the reductions in peak period traffic and v/c ratios on University under these alternatives, which would be beneficial. Also notable are some small numerical increases in peak period traffic on Clarke and Pulgas.
- Alternative 9 shows similar impacts on University as found for Willow under Alternatives 6/7 – net increases in total peak period traffic due to the express lanes and reductions in peak period traffic for the at-grade facility. Also noted are the reductions in traffic volumes and v/c ratios on Willow, which also are seen as beneficial, and more important to East Palo Alto, the minimal changes or reductions in peak period traffic on Clarke and Pulgas.

Generally, each alternative shows beneficial impacts compared to the no-build condition. Additional analysis will address these findings with respect to measures of effectiveness, which in turn will provide the basis for comparison of alternatives.

FIGURE 1
ALTERNATIVE 1: US 101 AUXILIARY LANES
YEAR 2025 AM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	**Build**
10400	**No Build**
+12%	**Percentage Difference** (No Build→Build)
NC	**No Change**

SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE
RAVENSWOOD OPEN SPACE PRESERVE
BAYFRONT EXWY
SEAPORT BLVD
BAYFRONT PARK
BLOMQUIST ST
VETERANS BLVD
WOODSIDE RD
CHESTNUT ST
BROADWAY
BAY RD
FLORENCE RD
HAVEN AV
DUMBARTON RR
SAN MATEO DR
DONOHO ST
5TH AV
MARSH RD
CALTRAIN LINE
MIDDLEFIELD RD
RINGWOOD AV
COLEMAN AV
WILLOW RD
UNIVERSITY AV
EMBARCADERO RD
OREGON EXPY
CLARKE AV
PULGAS AV
BAYLANDS NATURE PRESERVE
PALO ALTO MUNICIPAL GOLF COURSE
E. BAYSHORE RD
W. BAYSHORE RD
SHORELINE AT MOUNTAIN VIEW
AMPHITHEATRE PKWY
SHORELINE BLVD
BAYSHORE PKWY
FABIAN WY
CHARLESTON RD
SAN ANTONIO AV
L AVENIDA
OLD MIDDLEFIELD WY
W MIDDLEFIELD RD
RENGSTORFF AV
MOFFETT BLVD
E MIDDLEFIELD RD
ELLIS ST
FAIRCHILD DR
MANILA DR
TASMAN WEST LIGHT RAIL SYSTEM
STEVENS CREEK FRWY

Kimley-Horn and Associates, Inc.

FIGURE 2
ALTERNATIVE 1: US 101 AUXILIARY LANES
YEAR 2025 PM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND
11700	**Build**
10400	**No Build**
+12%	**Percentage Difference** (No Build→Build)
NC	**No Change**

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FIGURE 3
ALTERNATIVE 1: US 101 AUXILIARY LANES
YEAR 2025 AM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

.79	Build
.73	No Build

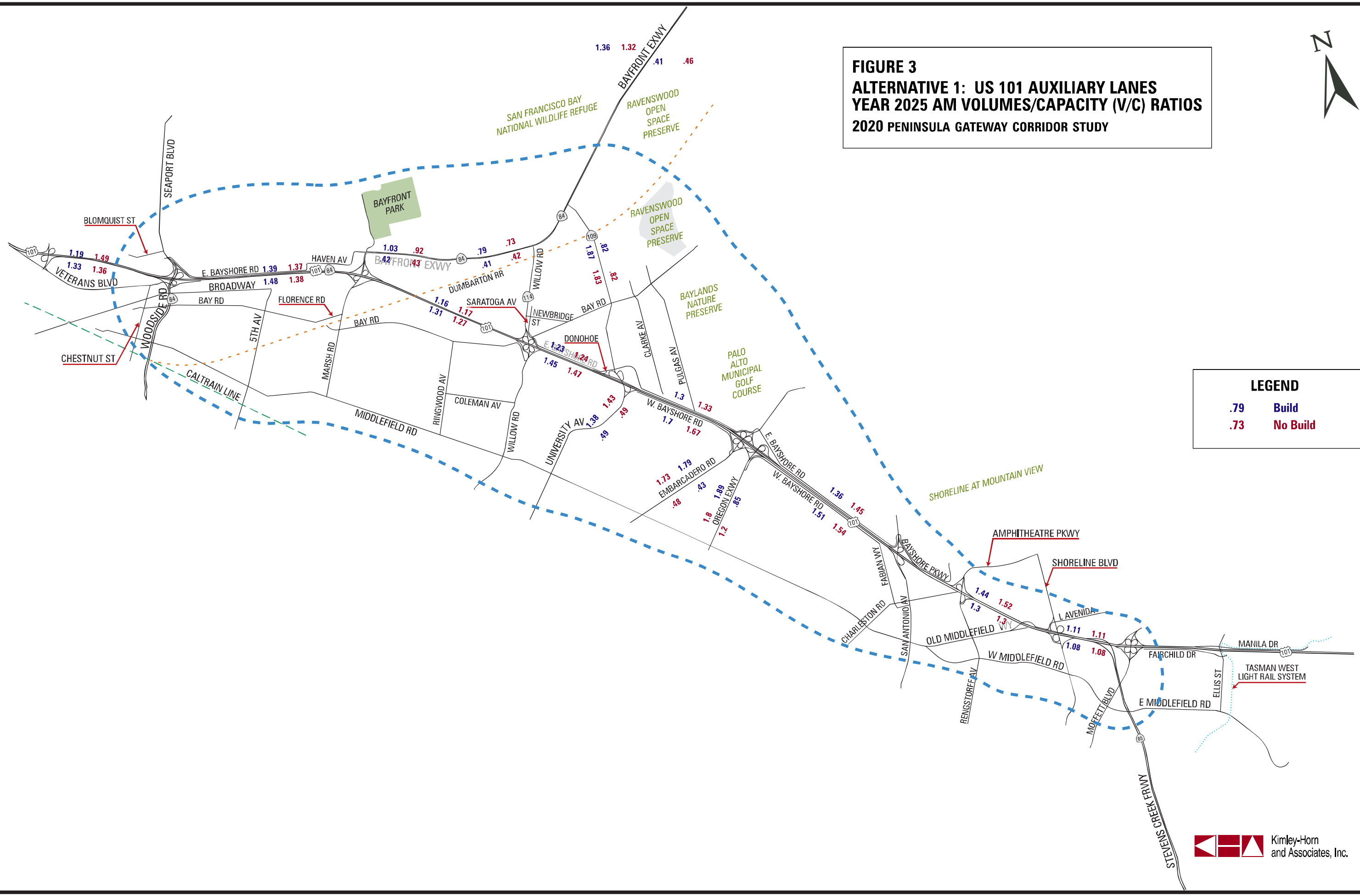

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FIGURE 4
ALTERNATIVE 1: US 101 AUXILIARY LANES
YEAR 2025 PM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

LEGEND

.79	Build
.73	No Build

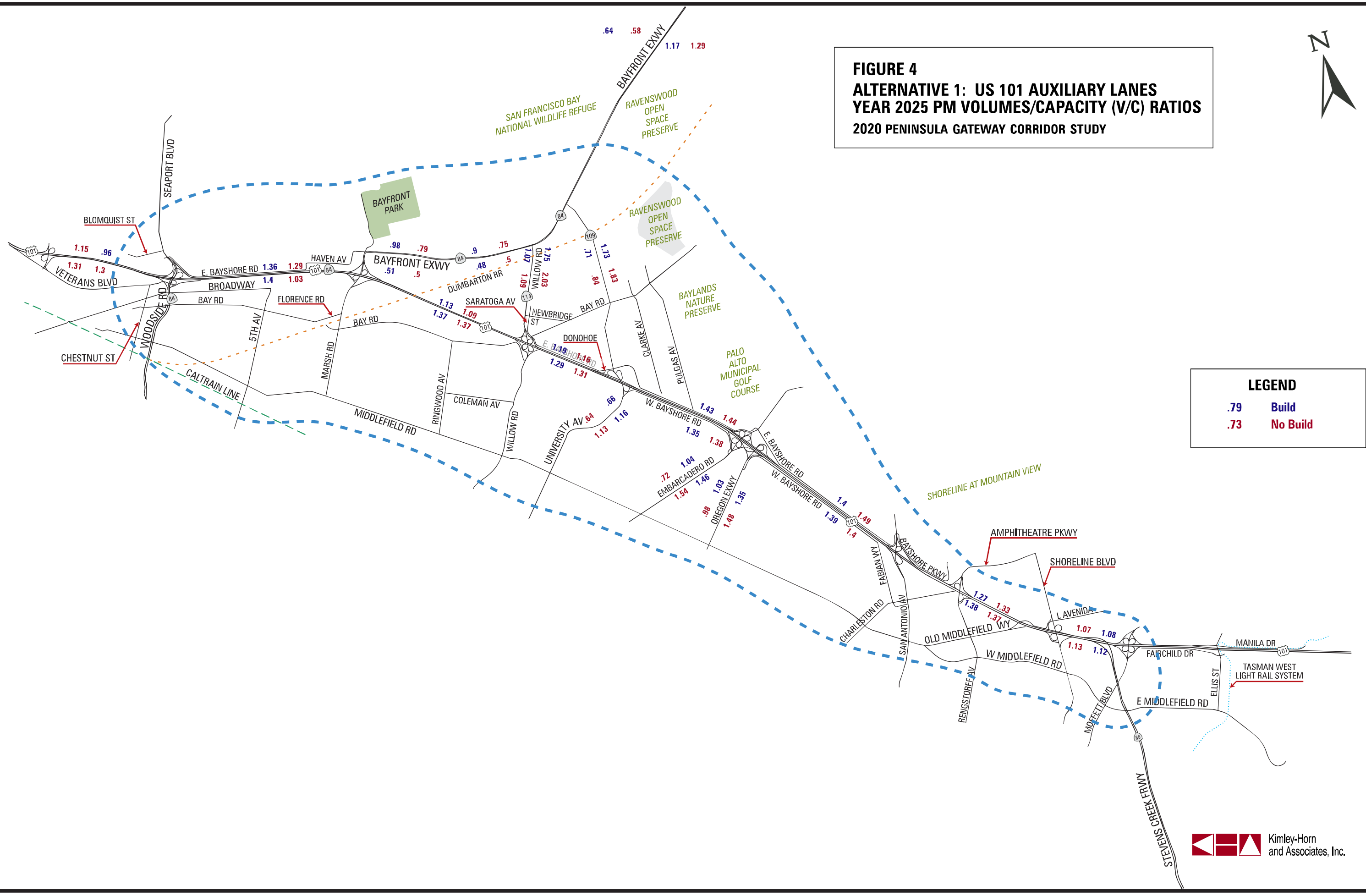

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FIGURE 5
ALTERNATIVE 2A: US 101 ELEVATED EXPRESS LANES
YEAR 2025 AM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	Build
10400	No Build
7800	Elevated (mix only)

Kimley-Horn and Associates, Inc.

FIGURE 6
ALTERNATIVE 2A: US 101 ELEVATED EXPRESS LANES
YEAR 2025 PM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	Build
10400	No Build
7800	Elevated (mix only)

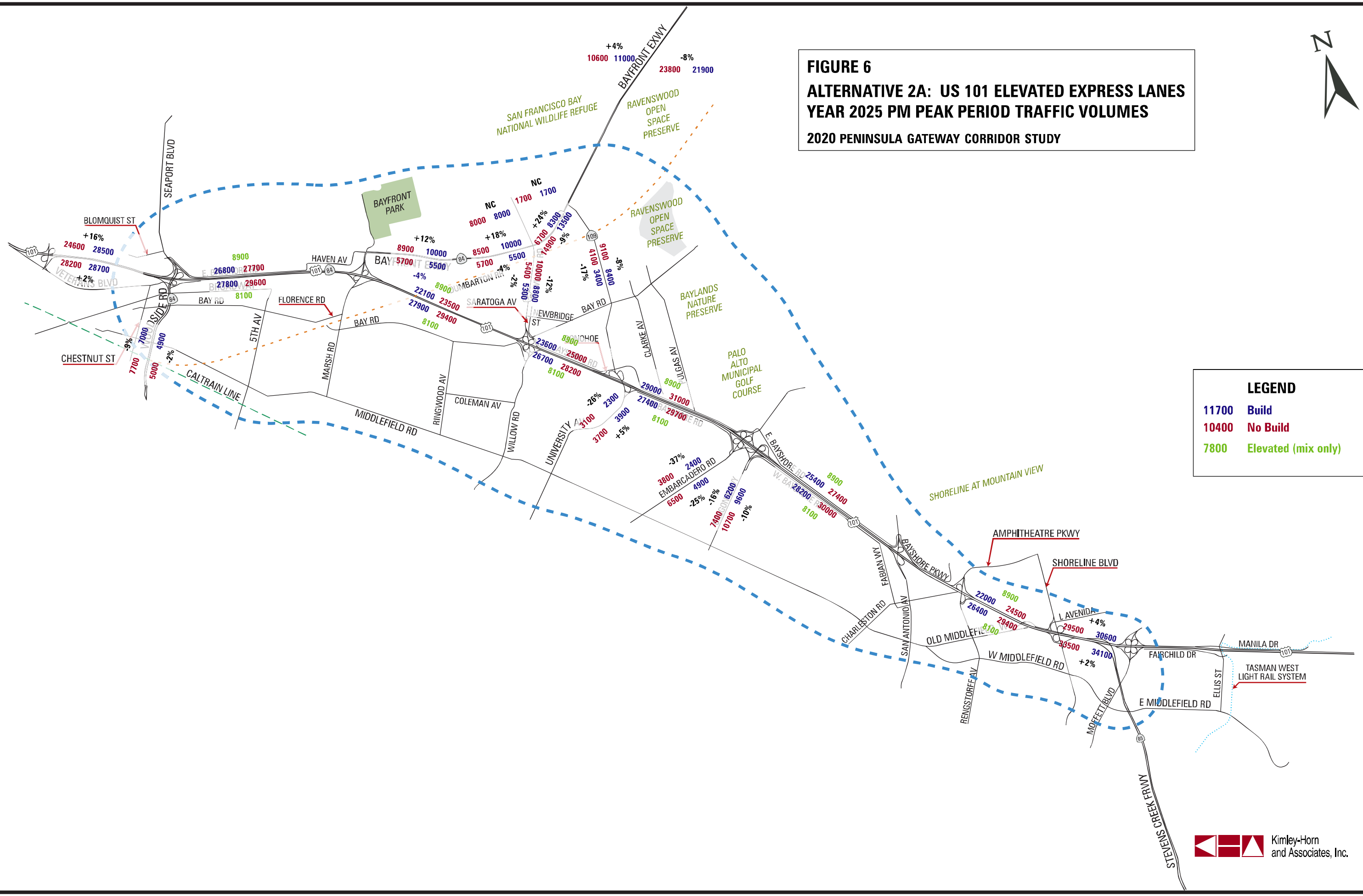

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FIGURE 7
ALTERNATIVE 2A: US 101 ELEVATED EXPRESS LANES YEAR 2025 AM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

.79	Build
.73	No Build
(1.27)	Elevated

BAYFRONT EXWY
SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE
RAVENSWOOD OPEN SPACE PRESERVE
SEAPORT BLVD
BAYFRONT PARK
BLOMQUIST ST
VETERANS BLVD
E. BAYSHORE RD
HAVEN AV
BROADWAY
BAY RD
FLORENCE RD
WOODSIDE RD
CHESTNUT ST
5TH AV
MARSH RD
CALTRAIN LINE
MIDDLEFIELD RD
RINGWOOD AV
COLEMAN AV
WILLOW RD
UNIVERSITY AV
IMBARTON RR
SARATOGA AV
NEWBRIDGE ST
BAY RD
DONOHOE
CLARKE AV
ALGAS AV
BAYLANDS NATURE PRESERVE
PALO ALTO MUNICIPAL GOLF COURSE
W. BAYSHORE RD
E. BAYSHORE RD
EMBARCADERO RD
OREGON EXWY
SHORELINE AT MOUNTAIN VIEW
AMPHITHEATRE PKWY
SHORELINE BLVD
BAYSHORE PKWY
FABIAN WY
SAN ANTONIO AV
CHARLESTON RD
L AVENIDA
OLD MIDDLEFIELD WY
W MIDDLEFIELD RD
RENGSTORFF AV
MOFFETT BLVD
E MIDDLEFIELD RD
ELLIS ST
FAIRCHILD DR
MANILA DR
TASMAN WEST LIGHT RAIL SYSTEM
STEVENS CREEK FRWY

Kimley-Horn and Associates, Inc.

FIGURE 8
ALTERNATIVE 2A: US 101 ELEVATED EXPRESS LANES YEAR 2025 PM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

LEGEND

.79 Build

.73 No Build

SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE

RAVENSWOOD OPEN SPACE PRESERVE

BAYFRONT PARK

BAYLANDS NATURE PRESERVE

PALO ALTO MUNICIPAL GOLF COURSE

SHORELINE AT MOUNTAIN VIEW

BAYFRONT EXWY

SEAPORT BLVD

BLOMQUIST ST

VETERANS BLVD

E. BAYSHORE RD

HAVEN AV

BROADWAY

BAY RD

FLORENCE RD

WOODSIDE RD

CHESTNUT ST

5TH AV

MARSH RD

CALTRAIN LINE

MIDDLEFIELD RD

RINGWOOD AV

COLEMAN AV

WILLOW RD

UNIVERSITY AV

EMBARCADERO RD

OREGON EXPY

W. BAYSHORE RD

E. BAYSHORE RD

IMBARTON RR

SARATOGA AV

NEWBRIDGE ST

DONOHOE

CLARKE AV

PULGAS AV

FABIAN WY

SAN ANTONIO AV

CHARLESTON RD

BAYSHORE PKWY

AMPHITHEATRE PKWY

SHORELINE BLVD

L AVENIDA

OLD MIDDLEFIELD WY

W MIDDLEFIELD RD

RENGSTORFF AV

MOFFETT BLVD

E MIDDLEFIELD RD

ELLIS ST

FAIRCHILD DR

MANILA DR

TASMAN WEST LIGHT RAIL SYSTEM

STEVENS CREEK FRWY

Kimley-Horn and Associates, Inc.

FIGURE 9
ALTERNATIVE 3: GRADE SEPARATIONS ON BAYFRONT EXPRESSWAY
YEAR 2025 AM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

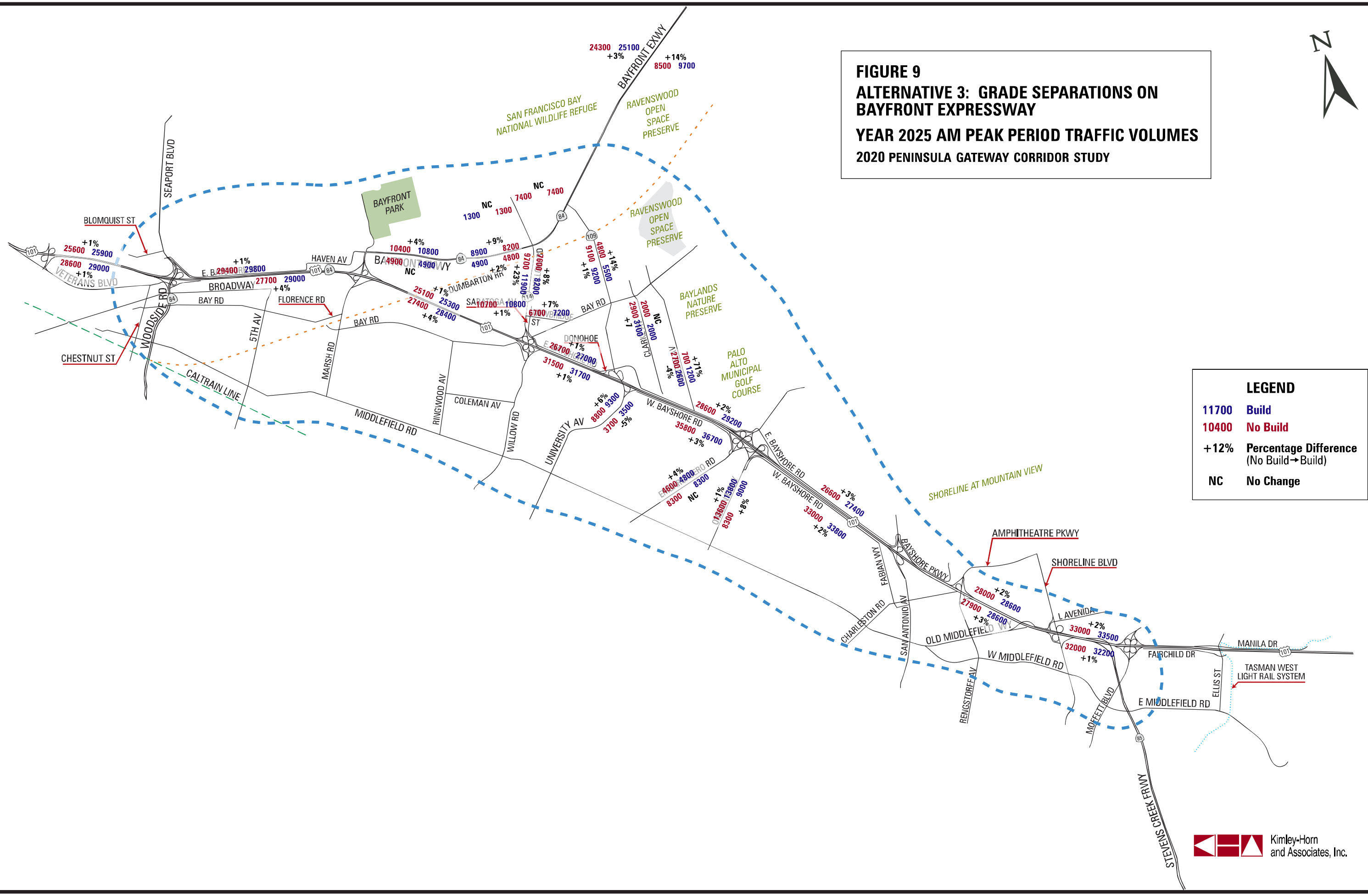


FIGURE 10
ALTERNATIVE 3: GRADE SEPARATIONS ON BAYFRONT EXPRESSWAY
YEAR 2025 PM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	Build
10400	No Build
+12%	Percentage Difference (No Build→Build)
NC	No Change

Kimley-Horn and Associates, Inc.

FIGURE 11
ALTERNATIVE 3: GRADE SEPARATIONS ON BAYFRONT EXPRESSWAY

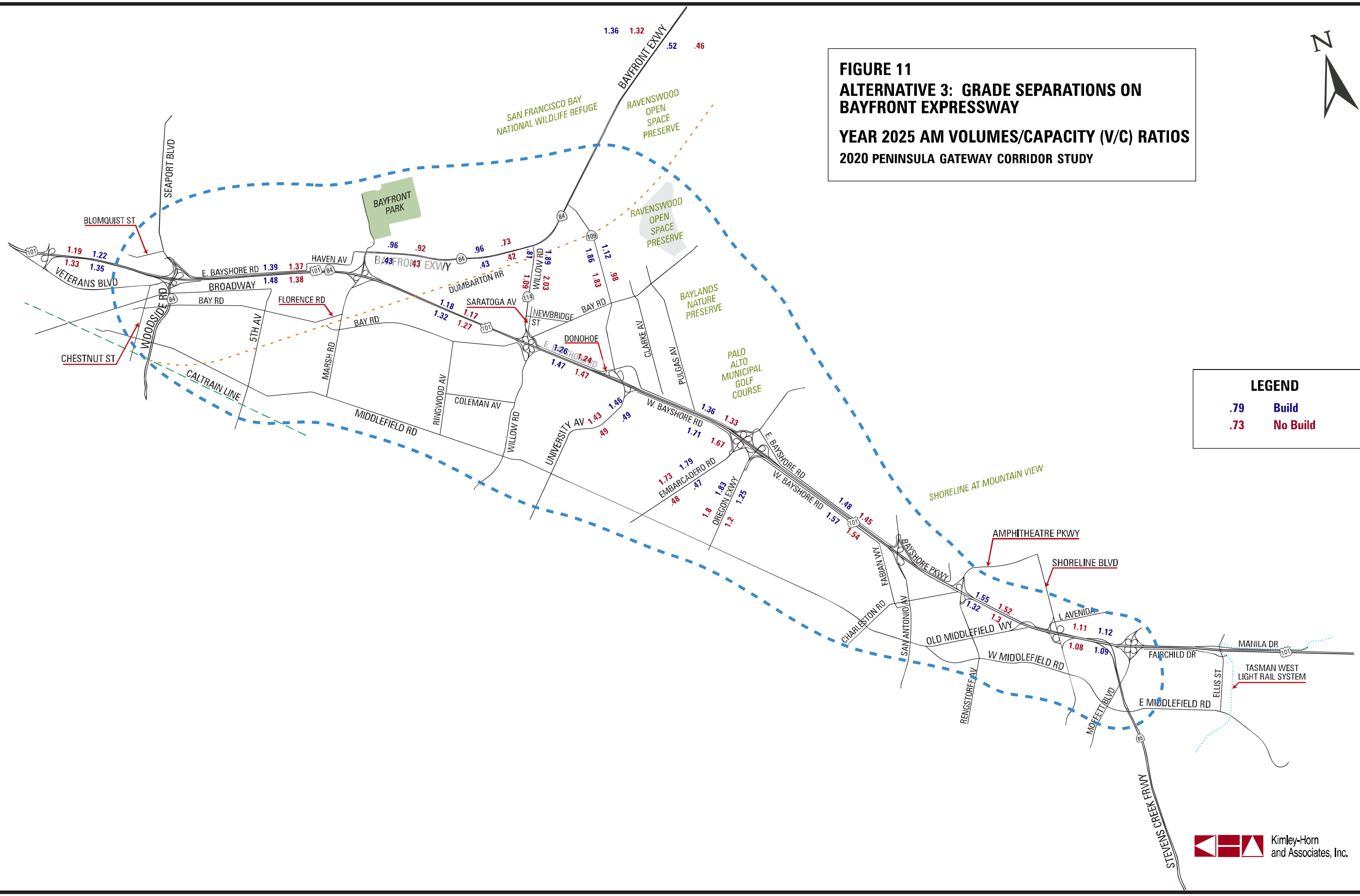
YEAR 2025 AM VOLUMES/CAPACITY (V/C) RATIOS

2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

.79	Build
.73	No Build



Kimley-Horn and Associates, Inc.

FIGURE 12
ALTERNATIVE 3: GRADE SEPARATIONS ON BAYFRONT EXPRESSWAY

YEAR 2025 PM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

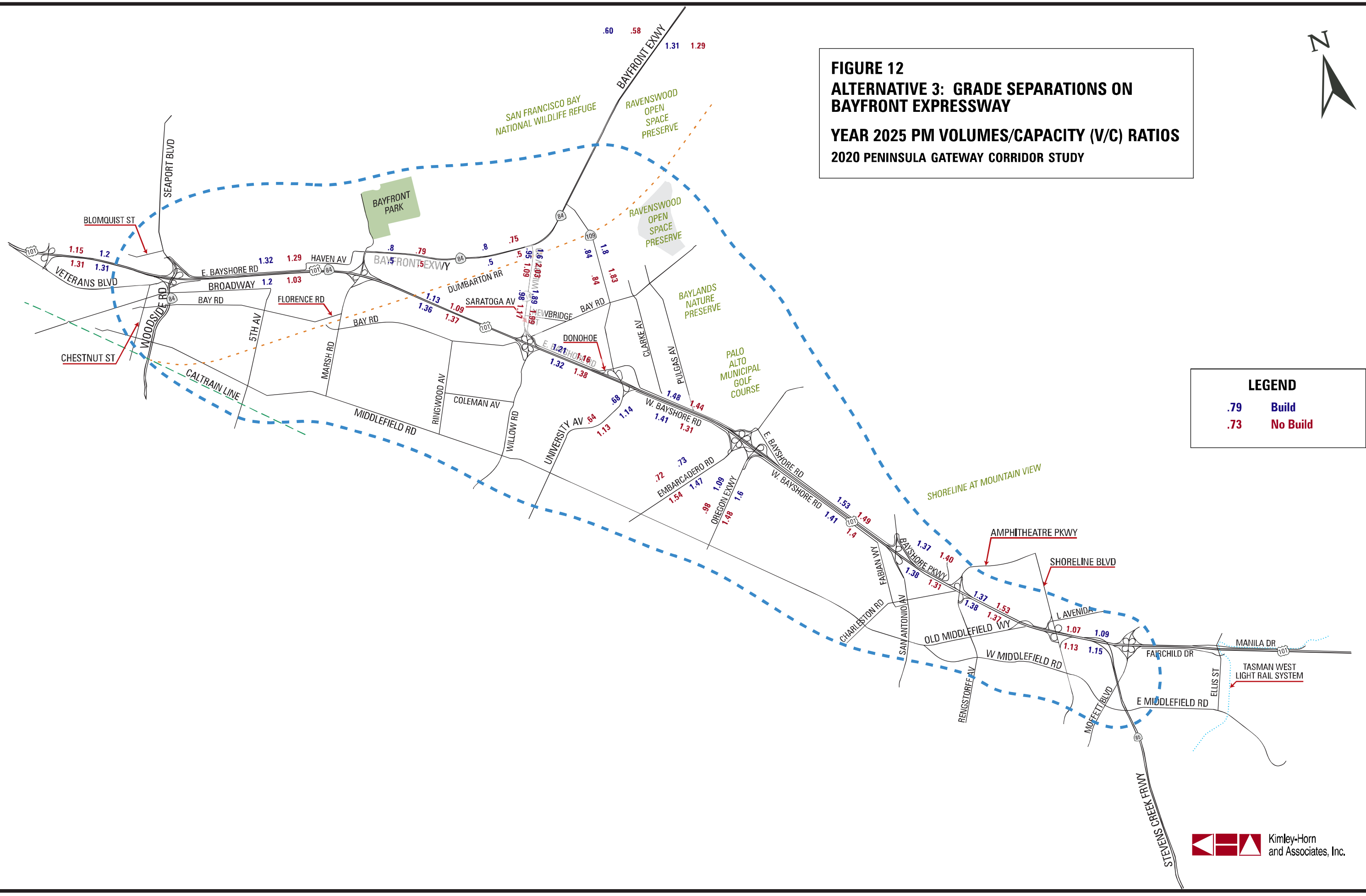


FIGURE 13
ALTERNATIVE 6: WILLOW ROAD *ELEVATED* EXPRESS LANES
ALTERNATIVE 7: WILLOW ROAD *DEPRESSED* EXPRESS LANES
YEAR 2025 AM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	Build
10400	No Build
+12%	Percentage Difference (No Build→Build)
NC	No Change
700	Elevated Alt 6
700	Depressed Alt 7

Kimley-Horn and Associates, Inc.

FIGURE 14
ALTERNATIVE 6: WILLOW ROAD *ELEVATED* EXPRESS LANES
ALTERNATIVE 7: WILLOW ROAD *DEPRESSED* EXPRESS LANES
YEAR 2025 PM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	**Build**
10400	**No Build**
+12%	**Percentage Difference** (No Build→Build)
NC	**No Change**
900	**Elevated Alt 6**
900	**Depressed Alt 7**

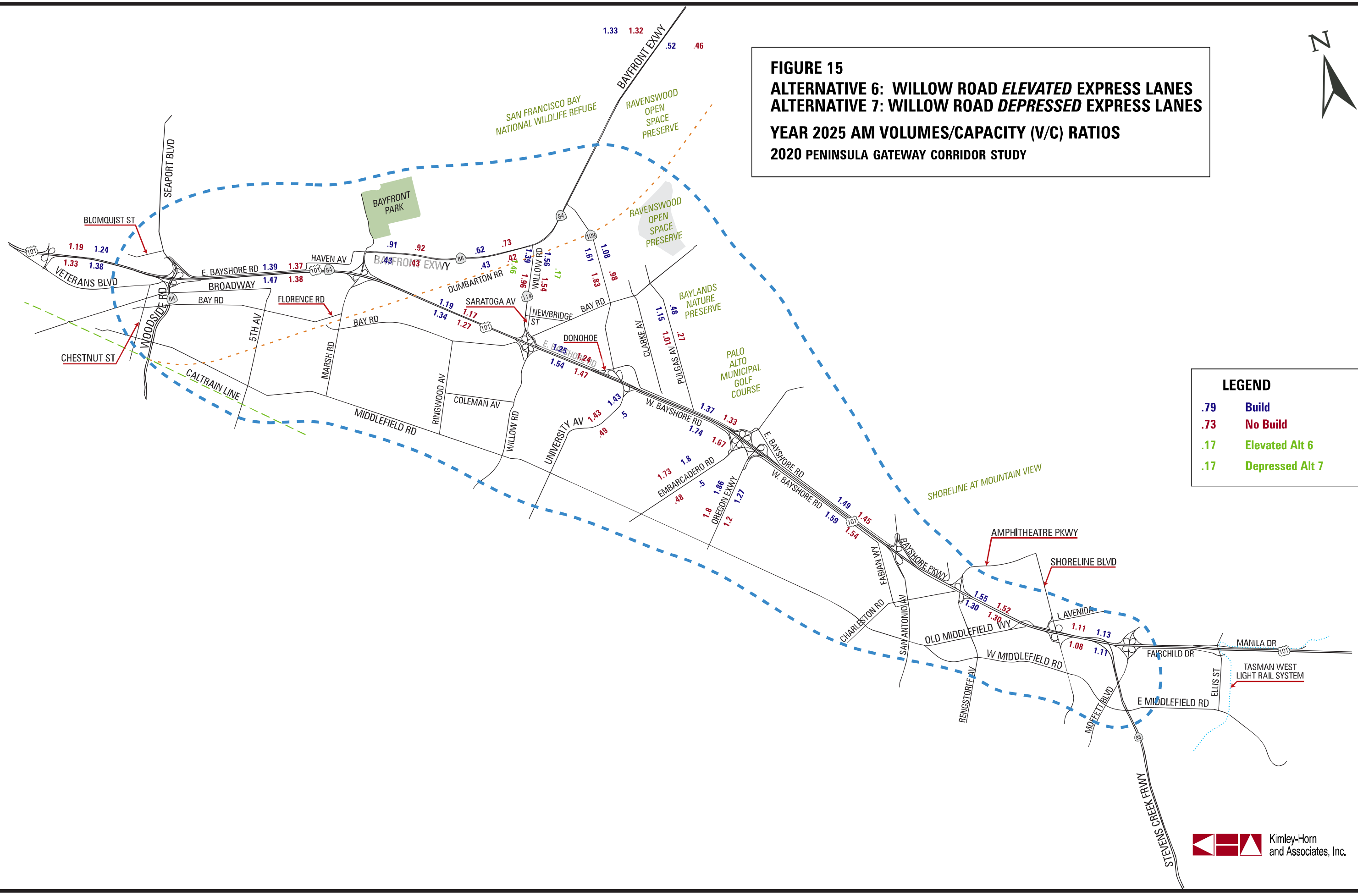
Kimley-Horn and Associates, Inc.

FIGURE 15
ALTERNATIVE 6: WILLOW ROAD *ELEVATED* EXPRESS LANES
ALTERNATIVE 7: WILLOW ROAD *DEPRESSED* EXPRESS LANES
YEAR 2025 AM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

.79	Build
.73	No Build
.17	Elevated Alt 6
.17	Depressed Alt 7



Kimley-Horn and Associates, Inc.

FIGURE 16
ALTERNATIVE 6: WILLOW ROAD *ELEVATED* EXPRESS LANES
ALTERNATIVE 7: WILLOW ROAD *DEPRESSED* EXPRESS LANES
YEAR 2025 PM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

.79	Build
.73	No Build
1.22	Elevated Alt 6
1.22	Depressed Alt 7

BAYFRONT EXWY
SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE
RAVENSWOOD OPEN SPACE PRESERVE
SEAPORT BLVD
BAYFRONT PARK
BLOMQUIST ST
VETERANS BLVD
E. BAYSHORE RD
HAVEN AV
BROADWAY
BAY RD
FLORENCE RD
WOODSIDE RD
CHESTNUT ST
5TH AV
MARSH RD
CALTRAIN LINE
MIDDLEFIELD RD
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WILLOW RD
UNIVERSITY AV
DUMBARTON RR
SARATOGA AV
NEWBRIDGE ST
DONOHOE
CLARKE AV
PULGAS AV
BAYLANDS NATURE PRESERVE
PALO ALTO MUNICIPAL GOLF COURSE
W. BAYSHORE RD
EMBARCADERO RD
OREGON EXWY
SHORELINE AT MOUNTAIN VIEW
AMPHITHEATRE PKWY
SHORELINE BLVD
BAYSHORE PKWY
FABIAN WY
SAN ANTONIO AV
CHARLESTON RD
L AVENIDA
OLD MIDDLEFIELD WY
W MIDDLEFIELD RD
RENGSTORFF AV
MOFFETT BLVD
FAIRCHILD DR
MANILA DR
TASMAN WEST LIGHT RAIL SYSTEM
ELLIS ST
E MIDDLEFIELD RD
STEVENS CREEK FRWY

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FIGURE 17
ALTERNATIVE 9: UNIVERSITY AVENUE DEPRESSED EXPRESS LANES
YEAR 2025 AM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

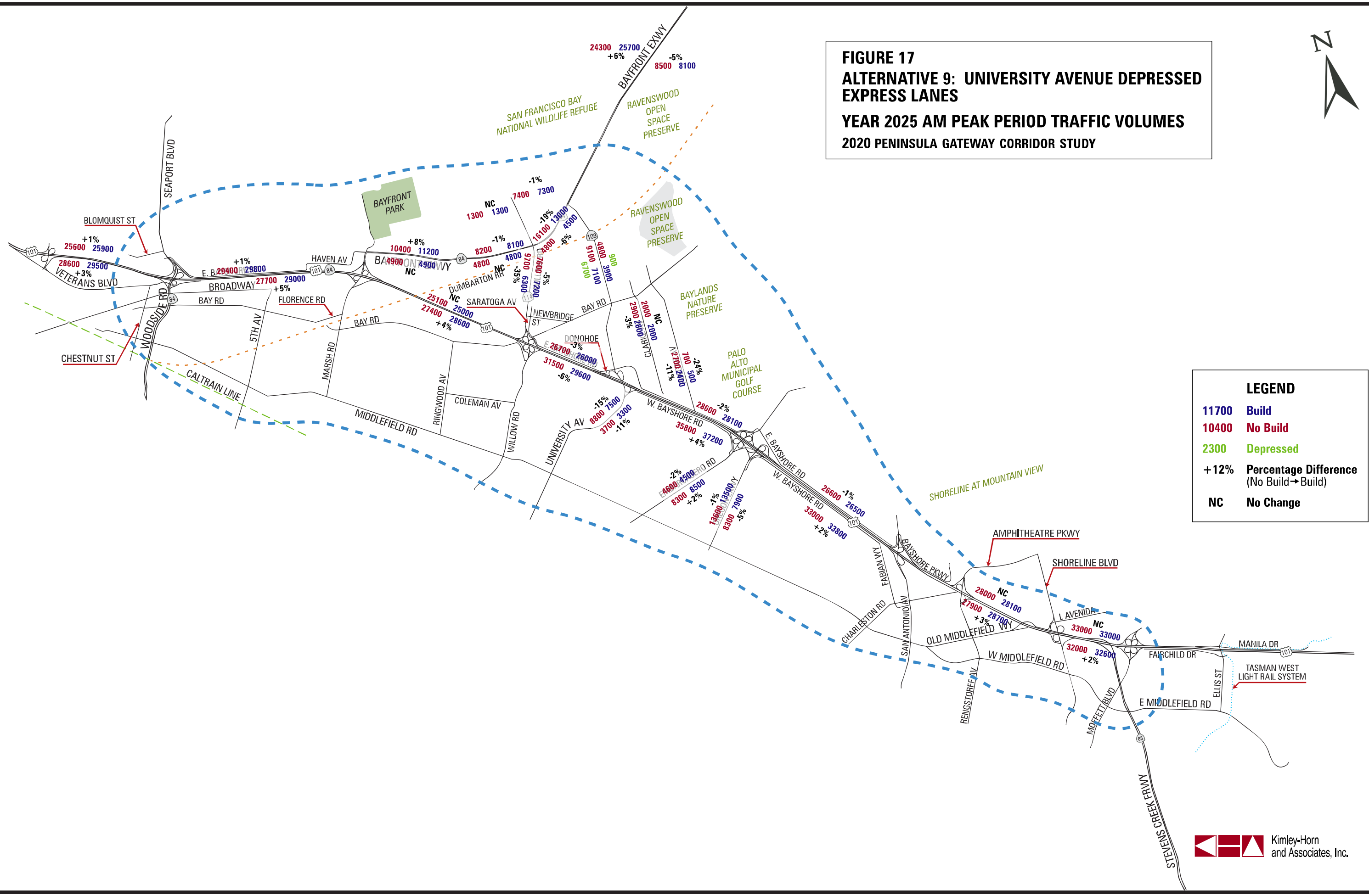


FIGURE 18
ALTERNATIVE 9: UNIVERSITY AVENUE DEPRESSED EXPRESS LANES
YEAR 2025 PM PEAK PERIOD TRAFFIC VOLUMES
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

LEGEND

11700	Build
10400	No Build
2300	Depressed
+12%	Percentage Difference (No Build→Build)
NC	No Change

Kimley-Horn and Associates, Inc.

FIGURE 19
ALTERNATIVE 9: UNIVERSITY AVENUE DEPRESSED EXPRESS LANES
YEAR 2025 AM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY

N

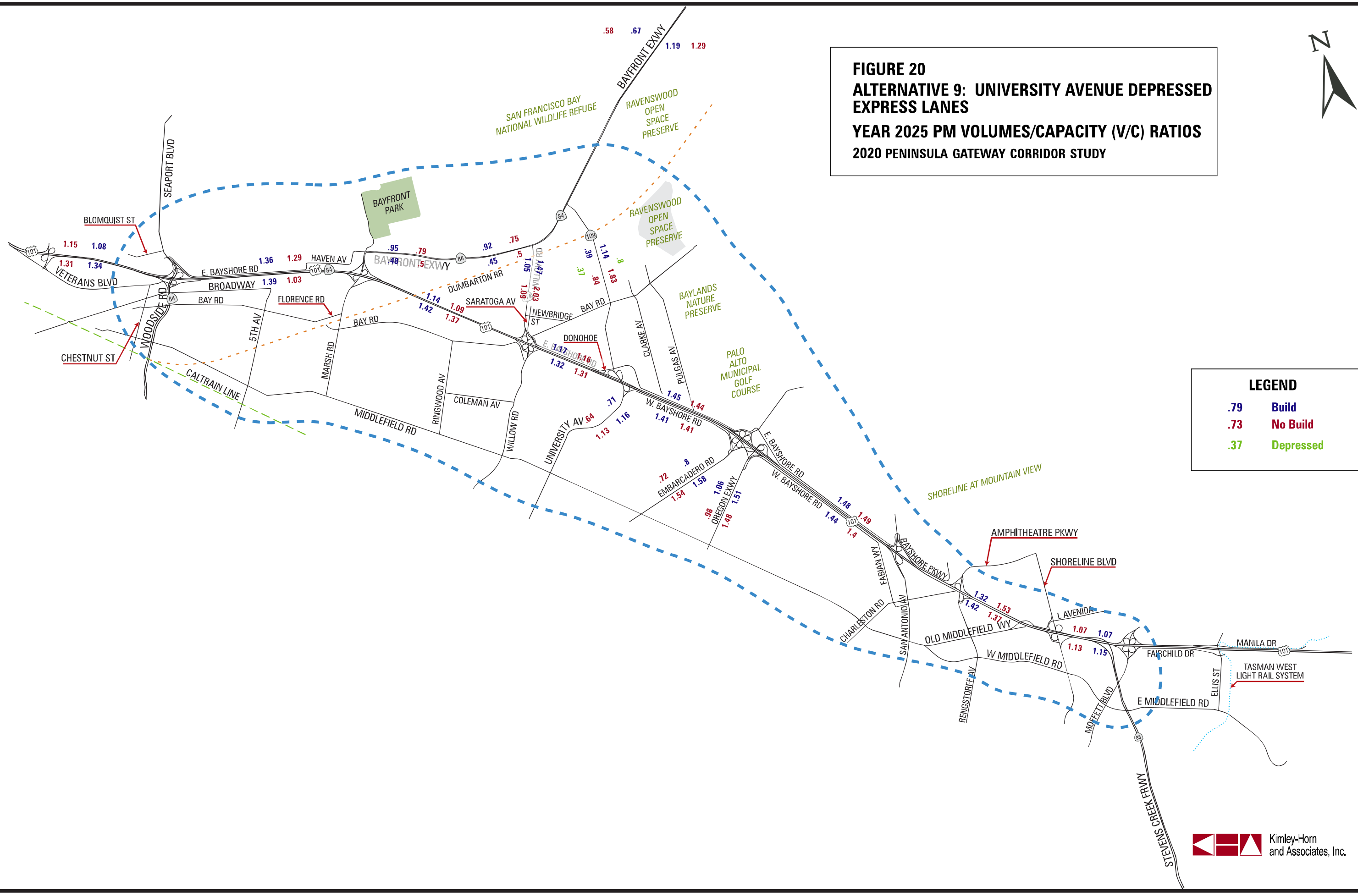
LEGEND

.79	Build
.73	No Build
1.09	Depressed

SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE
RAVENSWOOD OPEN SPACE PRESERVE
BAYFRONT EXWY
SEAPORT BLVD
BAYFRONT PARK
BLOMQUIST ST
VETERANS BLVD
E. BAYSHORE RD
HAVEN AV
BROADWAY
BAY RD
FLORENCE RD
WOODSIDE RD
CHESTNUT ST
5TH AV
MARSH RD
CALTRAIN LINE
MIDDLEFIELD RD
RINGWOOD AV
COLEMAN AV
WILLOW RD
DUMBARTON RR
SARATOGA AV
NEWBRIDGE ST
DONOHOE
CLARKE AV
PULGAS AV
BAYLANDS NATURE PRESERVE
PALO ALTO MUNICIPAL GOLF COURSE
UNIVERSITY AV
W. BAYSHORE RD
E. BAYSHORE RD
EMBARCADERO RD
OREGON EXWY
SHORELINE AT MOUNTAIN VIEW
AMPHITHEATRE PKWY
SHORELINE BLVD
BAYSHORE PKWY
FABIAN WY
CHARLESTON RD
SAN ANTONIO AV
L AVENIDA
OLD MIDDLEFIELD WY
W MIDDLEFIELD RD
RENGSTORFF AV
MOFFETT BLVD
E MIDDLEFIELD RD
ELLIS ST
FAIRCHILD DR
MANILA DR
TASMAN WEST LIGHT RAIL SYSTEM
STEVENS CREEK FRWY

Kimley-Horn and Associates, Inc.

FIGURE 20
ALTERNATIVE 9: UNIVERSITY AVENUE DEPRESSED EXPRESS LANES
YEAR 2025 PM VOLUMES/CAPACITY (V/C) RATIOS
2020 PENINSULA GATEWAY CORRIDOR STUDY



2020 Peninsula Gateway Corridor Study

Draft Memorandum
Task 5 – Travel Forecasting

Appendix – Discussion of Model Results

Prepared for:

City/County Association of Governments
Of San Mateo County

San Mateo County Transportation Authority

Santa Clara Valley Transportation Authority

Prepared by:

Kimley-Horn
and Associates, Inc.

December 22, 2006

HEXAGON TRANSPORTATION CONSULTANTS, INC.

MEMORANDUM

TO: Walter Martone

FROM: Jill Hough

COPIES TO: Paul Krupka, Kimley Horn
Jim Daisa, Kimley Horn

DATE: October 13, 2004

SUBJECT: ***Revised Discussion of Model Results for Peninsula Gateway 2000 Baseline and 2025 No Build***

The purpose of this memorandum is to discuss the results of the Peninsula Gateway Model Volumes for years 2000 and 2025. The year 2025 forecast represents a no-build condition in the context of the Peninsula Gateway Transportation Study and will be the basis of comparison for the Peninsula Gateway Atlernatives that will be defined in the future. The information presented herein represents a broadened discussion from the original memorandum dated August 13, 2004.

Year 2000 Model-Estimated Volumes and Link V/C Ratios

The year 2000 (and year 2025) travel demand model for the Peninsula Gateway Transportation Study embodies the ABAG Projections 2003 data sets. The following table (Table 1) presents a summary of households, employed residents, and total employment by county for existing and future conditions. As indicated in Table 1, growth in both workers and jobs will be significant in the future. The starting point for this model was the C/CAG subarea model for the 101 corridor between Whipple Road and Embarcadero Road. In addition to updating the land use data from ABAG Projections 2000 to ABAG Projections 2003, the model zone system was refined slightly in the Route 101 area in Mountain View. The model validation was improved for the Dumbarton Bridge and Route 101 between Embarcadero Road and Route 85.

The validation refinement was accomplished using hourly count data from Caltrans (obtained through Kimley-Horn). The Caltrans count data consisted of ramp volumes for 101 within the study corridor. Essentially all the ramps were represented, and there were no mainline count volumes. The mainline count volumes were obtained by appropriately adding and subtracting the ramp counts to the mainline counts that were estimated for Route 101 between University Avenue and Embarcadero Road.

The traffic assignments are for a three-hour peak period, both for AM and PM conditions. As such, the calculations taking place during the assignment algorithm are based on three-hour volumes versus three-hour capacity. The resulting V/C ratios represent the average ratio over the entire three-hour period.

The model assignment procedure employs a capacity-constraint equilibrium highway assignment algorithm, which means that the resulting assignment is capacity-constrained. The speed-capacity relationships (also

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phone 408.971.6100 • fax 408.971.6102 • www.hextrans.com

called volume-delay functions) that are coded for the links ensure that as congestion becomes a factor on the freeways (during the assignment process), some trips will get assigned to paths that use less or none of the freeway in order to accomplish the trip. However, the algorithm will assign all the demand in the AM and PM trip tables to the network, sometimes resulting in very high volume-to-

capacity (V/C) ratios on some of the freeway links. Some examples of locations with high V/C ratios are northbound Route 101 between San Antonio Road and Embarcadero Road (V/C=1.24) in the AM peak

Table 1
Summary of ABAG Projections

	P '00 Households			P '00 Employed Residents			P '00 Total Jobs		
County	2000	2025	% Growth	2000	2025	% Growth	2000	2025	% Growth
San Francisco	315,550	335,447	6.3%	422,100	464,998	10.2%	628,860	747,291	18.8%
San Mateo	254,370	283,799	11.6%	393,700	485,506	23.3%	380,370	470,291	23.6%
Santa Clara	567,080	681,379	20.2%	928,700	1,187,219	27.8%	1,077,220	1,353,591	25.7%
Alameda	514,620	591,291	14.9%	694,600	909,708	31.0%	725,790	991,191	36.6%
Contra Costa	338,860	435,445	28.5%	475,900	680,507	43.0%	360,090	537,386	49.2%
	P '03 Households			P '03 Employed Residents			P '03 Total Jobs		
County	2000	2025	% Growth	2000	2025	% Growth	2000	2025	% Growth
San Francisco	329,700	381,810	15.8%	444,851	519,300	16.7%	634,430	786,020	23.9%
San Mateo	254,104	296,520	16.7%	403,083	483,300	19.9%	395,890	506,470	27.9%
Santa Clara	565,863	733,350	29.6%	959,071	1,254,000	30.8%	1,092,330	1,418,810	29.9%
Alameda	523,366	642,210	22.7%	697,882	1,007,400	44.4%	751,680	1,028,620	36.8%
Contra Costa	344,129	444,920	29.3%	483,898	681,730	40.9%	361,110	505,440	40.0%

period; and northbound Route 101 between San Antonio Road and Embarcadero Road (V/C=1.13) in the PM peak period. A summary of the validation results on some of the key freeway segments are presented in Table 2.

Year 2025 Model Forecast Volumes and Link V/C Ratios

The year 2025 travel demand model for the Peninsula Gateway Transportation Study also embodies the ABAG Projections 2003 data sets. The growth assumptions associated with ABAG Projections 2003, with respect to jobs and households is presented in Table 1 above.

The traffic forecasts are for a three-hour peak period, both for AM and PM conditions. As such, the calculations taking place during the assignment algorithm are based on three-hour volumes versus three-hour capacity. The resulting V/C ratios represent the average ratio over the entire three-hour period.

The 2025 model assignment procedure is predicated on the identical equilibrium highway assignment algorithm, volume-delay functions, and condition that all the demand in the AM and PM trip tables must be assigned to the network, sometimes resulting in very high volume-to-capacity (V/C) ratios on some of the

freeway links. Some examples of locations with high V/C ratios are northbound Route 101 between Route 85 and Shoreline Road (V/C=1.26) in the AM peak period; and southbound Route 101 between Embarcadero Road and San Antonio Road (V/C=1.05) in the PM peak period.

Table 2
Comparison Of Model Estimated Volumes Versus Counts

			AM PEAK PERIOD					PM PEAK PERIOD				
Corridor	Segment	Direction	Existing	2000 Model	Model - Existing	Model - Ex Per Hour	% Differ (mod v ex)	Existing	2000 Model	Model - Existing	Model - Ex Per Hour	% Differ (mod v ex)
US 101	between Redwood Shores & Whipple1	NB	22,903	26,899	3,996	1,332	17.4%	23,361	27,780	4,419	1,473	18.9%
		SB	26,008	27,349	1,341	447	5.2%	24,380	26,917	2,537	846	10.4%
	between Whipple & Woodside	NB	21,896	25,961	4,065	1,355	18.6%	23,435	26,617	3,182	1,061	13.6%
		SB	23,149	26,233	3,084	1,028	13.3%	22,004	26,075	4,071	1,357	18.5%
	between Woodside & Marsh	NB	22,083	25,006	2,923	974	13.2%	23,144	26,114	2,970	990	12.8%
		SB	21,564	23,393	1,829	610	8.5%	20,350	22,866	2,516	839	12.4%
	between Marsh & Willow	NB	19,756	19,315	-441	-147	-2.2%	21,295	23,886	2,591	864	12.2%
		SB	19,741	22,883	3,142	1,047	15.9%	19,414	20,411	997	332	5.1%
	between Willow & University	NB	21,370	17,810	-3,560	-1,187	-16.7%	23,765	26,224	2,459	820	10.3%
		SB	22,569	22,147	-422	-141	-1.9%	20,654	21,049	395	132	1.9%
	between University & Embarcadero	NB	20,775	19,222	-1,553	-518	-7.5%	23,765	29,461	5,696	1,899	24.0%
		SB	24,897	24,953	56	19	0.2%	20,654	21,936	1,282	427	6.2%
Rte 84	Dumbarton Bridge	EB	3,936	3,320	-616	-205	-15.7%	13,039	17,298	4,259	1,420	32.7%
		WB	10,649	13,182	2,533	844	23.8%	4,414	5,681	1,267	422	28.7%
Bayfront	between Marsh & Crysler	NB	5,855	10,393	4,538	1,513	77.5%	3,521	4,629	1,108	369	31.5%
		SB	4,026	4,821	795	265	19.7%	3,522	8,120	4,598	1,533	130.6%
	between Crysler & Chilco	NB	_	10,393	_	_		_	4,629	_	_	
		SB	_	4,821	_	_		_	8,120	_	_	
	between Chilco & Willow	NB	5,142	9,532	4,390	1,463	85.4%	2,498	3,613	1,115	372	44.6%
		SB	2,324	2,359	35	12	1.5%	3,424	7,473	4,049	1,350	118.3%
	between Willow & University	NB	8,044	11,475	3,431	1,144	42.7%	3,535	5,086	1,551	517	43.9%
		SB	2,770	2,373	-397	-132	-14.3%	9,752	11,879	2,127	709	21.8%
	between University & Dumbarton	NB	_	13,182	_	_		_	5,681	_	_	
		SB	_	3,320	_	_		_	17,298	_	_	
Marsh	between Bayfront & 101 NB ramps	EB	4,425	1,396	-3,029	-1,010	-68.5%	3,224	2,516	-708	-236	-22.0%
		WB	5,531	5,597	66	22	1.2%	3,623	2,880	-743	-248	-20.5%
	between 101 SB- & 101 NB-ramps	EB	4,383	1,243	-3,140	-1,047	-71.6%	2,819	2,404	-415	-138	-14.7%

Corridor	Segment	Direction	Existing	2000 Model	Model - Existing	Model - Ex Per Hour	% Differ (mod v ex)	Existing	2000 Model	Model - Existing	Model - Ex Per Hour	% Differ (mod v ex)
Marsh		WB	3,162	301	-2,861	-954	-90.5%	3,529	602	-2,927	-976	-82.9%
	between 101 SB ramps & Scott	EB	3,727	1,658	-2,069	-690	-55.5%	2,507	549	-1,958	-653	-78.1%
		WB	4,329	678	-3,651	-1,217	-84.3%	4,153	1,139	-3,014	-1,005	-72.6%
	between Scott & Bohannon	EB	_	1,510	_	_		_	967	_	_	
		WB	_	879	_	_		_	950	_	_	
	west of Bohannon	EB	_	863	_	_		_	672	_	_	
Willow	between Bayfront & Hamilton	EB	2,741	2,223	-518	-173	-18.9%	6,030	5,044	-986	-329	-16.4%
		WB	3,934	2,253	-1,681	-560	-42.7%	2,848	3,148	300	100	10.5%
	between Hamilton & O'Brien	EB	3,755	2,804	-951	-317	-25.3%	4,137	5,128	991	330	24.0%
		WB	3,525	2,609	-916	-305	-26.0%	3,503	3,471	-32	-11	-0.9%
	between O'Brien & New Bridge	EB	4,761	2,618	-2,143	-714	-45.0%	4,247	5,070	823	274	19.4%
		WB	4,462	2,582	-1,880	-627	-42.1%	4,544	3,424	-1,120	-373	-24.6%
	between New Bridge & Bay	EB	5,593	3,050	-2,543	-848	-45.5%	2,174	5,829	3,655	1,218	168.1%
		WB	6,355	4,285	-2,070	-690	-32.6%	5,534	3,961	-1,573	-524	-28.4%
	between Bay & Durham	EB	3,143	1,536	-1,607	-536	-51.1%	5,975	2,314	-3,661	-1,220	-61.3%
		WB	3,040	2,962	-78	-26	-2.6%	3,227	1,636	-1,591	-530	-49.3%
	between Durham & Coleman	EB	_	1,556	_	_		_	2,393	_	_	
		WB	_	2,852	_	_		_	1,566	_	_	
	between Colemand & Gilbert	EB	_	1,536	_	_		_	2,314	_	_	
		WB	_	2,962	_	_		_	1,636	_	_	
	between Gilbert & Middlefield	EB	_	971	_	_		_	1,985	_	_	
		WB	_	2,331	_	_		_	1,248	_	_	

Footnotes/Notes:
1 SB Segment is between Brittan Ave and Whipple
Other Notes:
1. "*" Indicates that a count was not available.
2. "-" Indicates that a segment or ramp is not applicable in the given direction.
3. The majority of Arterial Volumes under "Existing Volumes" were factored from a 1-hour count volume using a factor of 2.7.
4. The model estimated volumes are within one-half a lane of traffic capacity for the respective roadway segment, which was the model validation criterion that was followed.
5. One half a lane of traffic capacity is roughly 1150 per hour for freeways; 925 per hour for expressways; and 750 and 900 for minor and major arterials, respectively.

Increased Traffic Congestion

As shown in the tables above, Route 101 is and will continue to be operating at capacity. Instances of calculated volume-to-capacity ratios of greater than 1.0 can be complicated to interpret and are the result of many contributing factors. Some of the more significant factors are summarized as follows:

- The model V/C ratios are based on approximate link capacities; actual V/C ratios are based on operational capacity, which can vary from segment to segment,

- The model is validated against freeway counts that have been estimated from a count station to the north of the study area and a series of ramp counts which fluctuate significantly on a daily basis; an actual count taken within the study are might yield a different observed result than the estimated count upon which the validation is based, and

- The forecasts are based on growth trends indicated in the ABAG Projections 2003 land use and socio-economic projections. Unlike previous forecasts that showed higher job growth rates (than worker growth rates) in Alameda and Contra Costa Counties, the recent forecasts show the job growth rates in these counties to be lower than the growth rate in employed residents (workers); So the net effect could be increased in-commuting to San Mateo and Santa Clara Counties and increased demands on the Dumbarton Bridge and Highway 101.

For purposes of operational analysis, depending on how capacities are modeled, it might be desirable to strip some of the trips (associated with the very congested links) out of the trip tables. This could be done with simple factoring until capacity is reached on the most critical link of the system. The important things to consider in this factoring process is whether the operations model reflects an accurate profile of capacity along the corridor (in which case the operations model could be used to determine the critical link). Alternately, the critical link could be measured by observing conditions in the field and/or conducting speed surveys. Virtually all the methods mentioned have some inherent margin of error or shortcoming but any of them can provide a sufficient means of arriving at a baseline set of operations by which the alternatives can be reasonably measured.